PRACTICE ABSTRACT

Clover-grass protein by bio-refining: nutrient com-position and shelf life

Problem

Alternative protein sources can increase the use of locally produced protein, supporting the transition to 100% organic feeding. Clover-grass concentrate has a high protein content with a good amino acid profile for poultry. It is necessary to dry the green protein paste to maintain a good quality, but the drying process is expensive.

Solution

Anaerobic storage of fresh green protein, it's nutritional value and shelf life were measured over 6 months. Measures included pH, bacteria concentration of lactic acid bacteria and coliform bacteria, short chain fatty acids, dry matter (DM) and ash content, nitrogen and amino acids. Time intervals: 0, 0.5, 1, 2, 3, 4, 5 and 6 months after harvest. Additional effects of temperature (24^0C and 4^0C) and added lactic acid bacteria were also tested

Benefits

Green protein can substantially increase the proportion of locally produced protein used in animal feed, reducing imports of soy-based protein sources. Green protein concentrate contains a high protein and amino acid content. Storage of the green protein preserves protein quality and extends its value as a feed source. Anaerobic storage on farm would be much cheaper than drying.

Practical recommendation

- Protein content of the green protein concentrate was 48.5% DM on the day of harvest and the methionine (10.8g/kg DM) and lysine content (31.4g/kg DM) was optimal for both poultry and pigs.
- Dry matter, ash, protein (Figure 1) and amino acid (Figures 2 and 3) content increased during storage.
- Samples stored at 24°C had high concentrations of butyric acid. Butyric acid-forming bacteria, e.g. clostridia, use lactic acid as a substrate to produce butyric acid (Figure 4). It is crucial that the product maintains a good quality during storage. Concentration of lactic acid bacteria was highest in samples stored at 4 °C (Figure 5).
- Shelf life of fresh green protein concentrate is limited. Under anaerobic conditions, the product is stable at: 24°C for a maximum of 2 months, at 4°C for a maximum of 3 months.
- Temperature was the most significant determinant of shelf life – adding lactic acid bacteria had minimal effect.

Applicability box

Theme

Layers, Feeding, Processing and handling of harvested feed

Context

Temperate climate, Middle and Northern Europe. Clover grass concentrate as a protein source for poultry and methods to store the green protein during winter.

Application time

Possible all year round if the protein paste is stored under optimal conditions to maintain a good quality.

Required time

Harvest time of clover grass between May and September, and processed in a bio-refining plant, dried and stored.

Period of impact

Potential to be used for feeding monogastrics all year if available. If not dried, the protein paste can be stored in closed containers at cool conditions for a shorter period.

Equipment

Machinery required for harvest of green material (clover/grass/ alfalfa) and for transportation to a bio-refinery plant, drying and storage facilities.

Best in

Green protein can be used in feed for monogastrics as a source with a high protein content and optimal amino acid profile. It is good to use in crop rotation.

- Dried green protein has a dry matter content > 90-95%. The dry matter content of the green protein the day of harvest was 44%. To avoid microbial spoilage during anaerobic storage, reducing the water content during the bio-refining process would be desirable.
- Cooperation with a bio-refinery plant is recommended to produce the clover-grass protein concentrate, for either wet or dry storage.

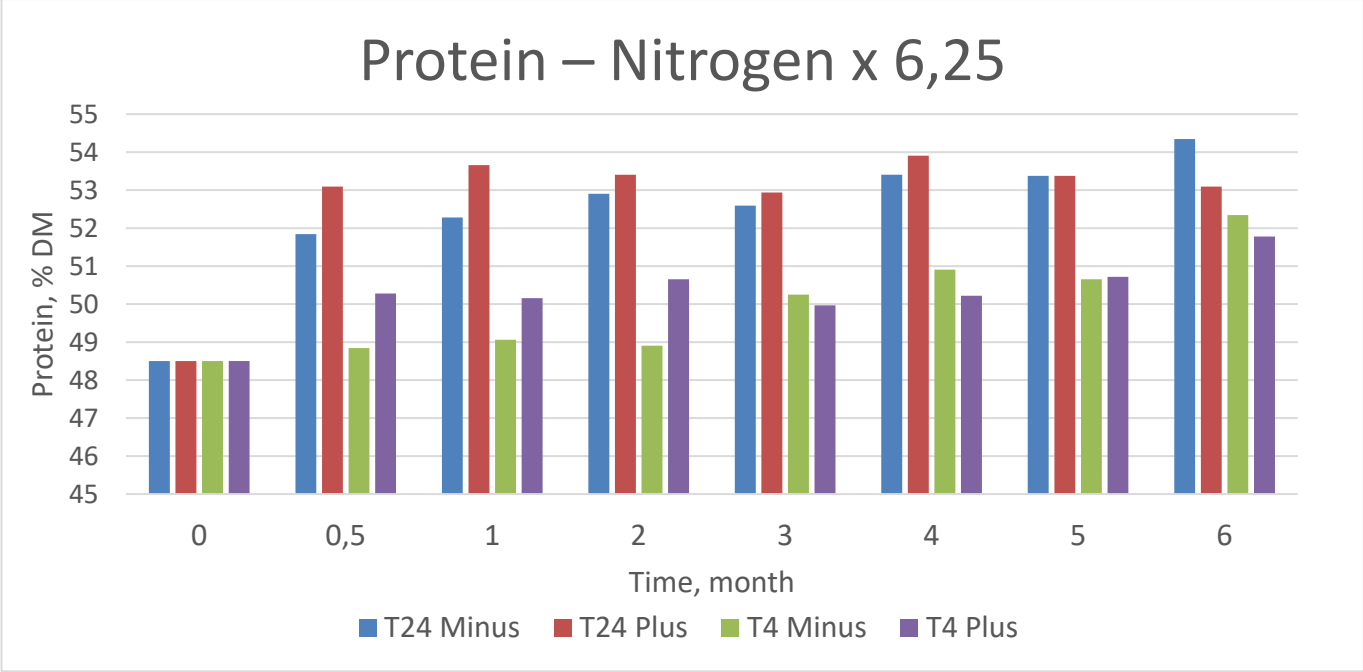

Figure 1. Protein content in green protein concentrate from clover grass stored over 6 months. Samples has been taken at regular intervals. Samples are stored at 24^{0}C: T24 Minus: without LAB (lactic acid bacteria), T24 Plus: with LAB or at 4^{0}C: T4 Minus without LAB, T4 Plus: with LAB.

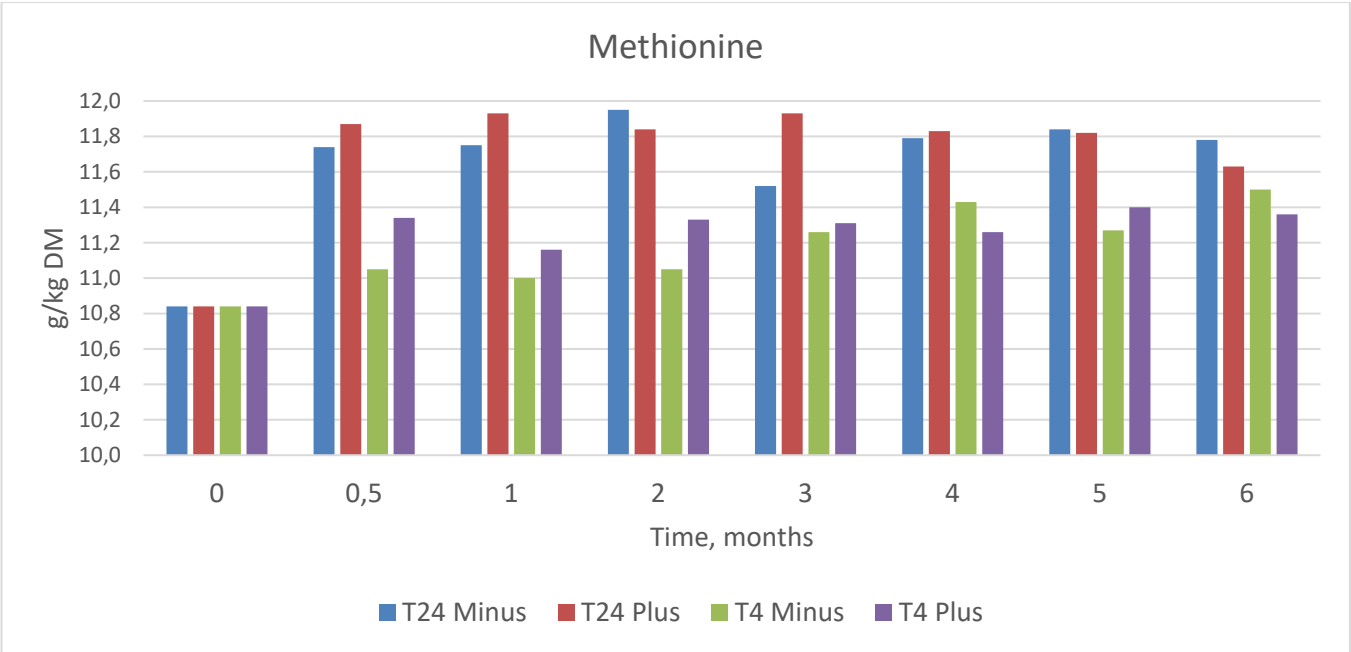

Figure 2. Methionine content in green protein concentrate from clover grass stored over 6 months. Samples has been taken at regular intervals. Samples are stored at 24^{0}C: T24 Minus: without LAB (lactic acid bacteria), T24 Plus: with LAB or at 4^{0}C: T4 Minus without LAB, T4 Plus: with LAB.

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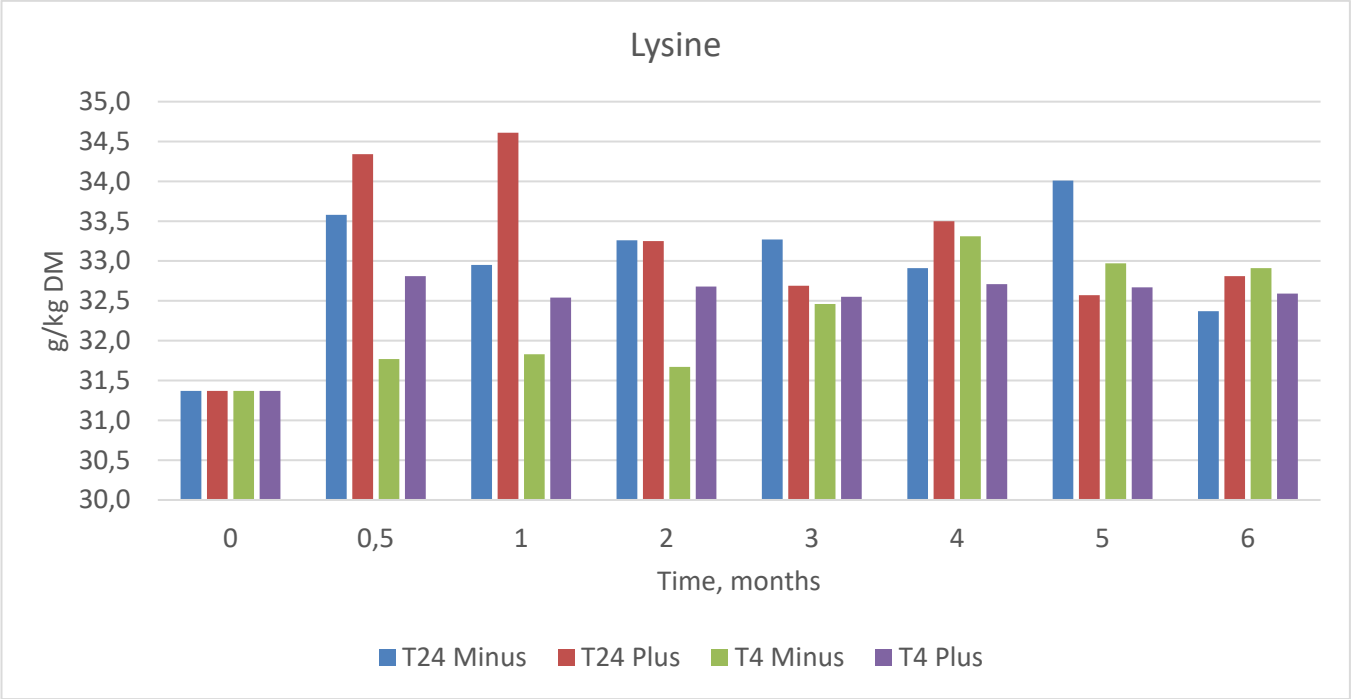

Figure 3. Lysine content in green protein concentrate from clover grass stored over 6 months. Samples has been taken at regular intervals. Samples are stored at 24^{0}C: T24 Minus: without LAB (lactic acid bacteria), T24 Plus: with LAB or at 4^{0}C: T4 Minus without LAB, T4 Plus: with LAB.

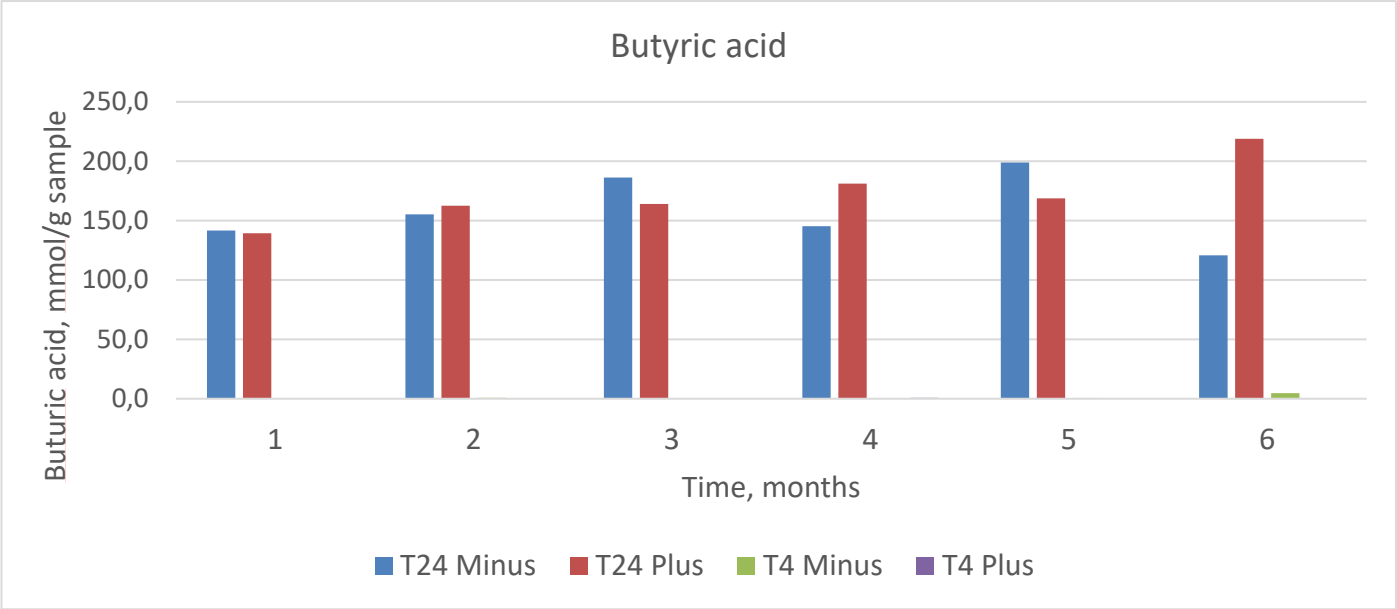

Figure 4. Butyric acid content in green protein concentrate from clover grass stored over 6 months. Samples has been taken at regular intervals. Samples are stored at 24^{0}C: T24 Minus: without LAB (lactic acid bacteria), T24 Plus: with LAB or at 4^{0}C: T4 Minus without LAB, T4 Plus: with LAB.

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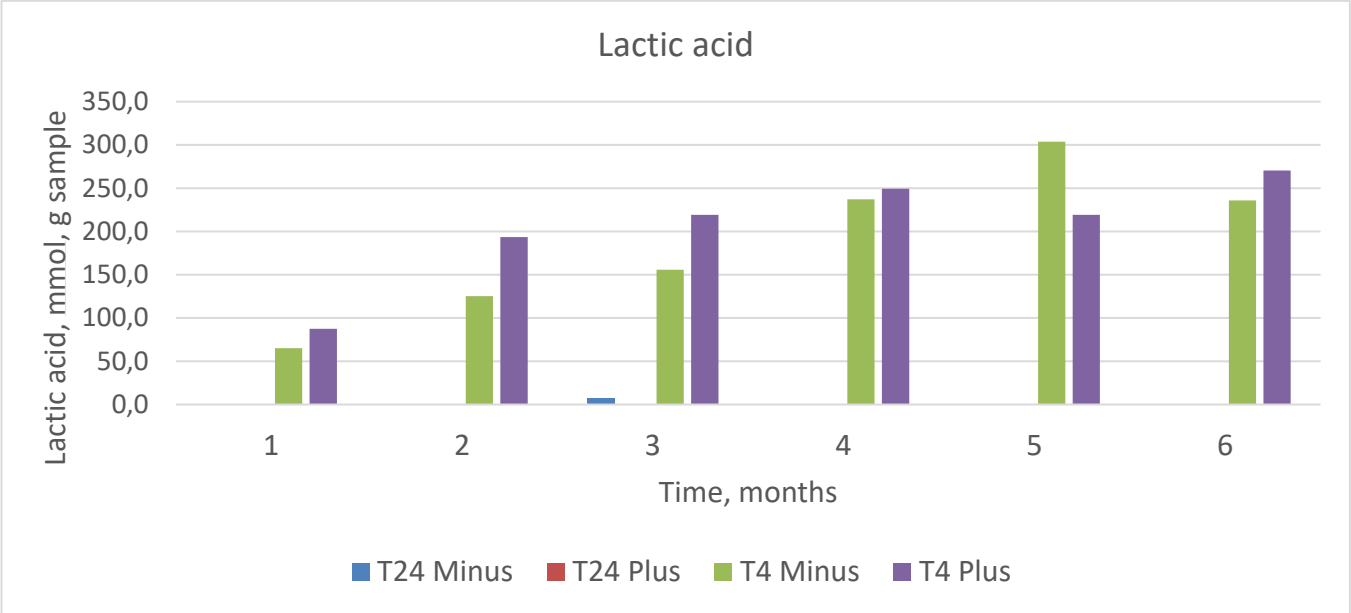

Figure 5. Lactic acid content in green protein concentrate from clover grass stored over 6 months. Samples has been taken at regular intervals. Samples are stored at 24^{0}C: T24 Minus: without LAB (lactic acid bacteria), T24 Plus: with LAB or at 4^{0}C: T4 Minus without LAB, T4 Plus: with LAB.

Further information

Video

- "Clover-grass protein by bio-refining – Nutrient composition and shelf life"
- "GRASS PROTEIN – a golden chance to improve organic farming"
- "Harvest of Green Biomass", a video about lucerne

Further reading

- Report on "Green Biomass – Protein Production Through Bio-refining"
- OrganoFinery "Organic growth with biorefined organic protein feed, fertilizer and energy"

Weblinks

- Check the Organic Farm Knowledge platform for more practical recommendations.

About this practice abstract and OK-Net EcoFeed

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Project website: ok-net-ecofeed.eu

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